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Subject: Evaluation of Douglas-fir Beetle Populations and Treatment Effectiveness in the Maudlow-Toston and Cave Gulch Fires (TR 02-37)

To: Forest Supervisor Helena National Forest

During October of 2002, Nancy Sturdevant, entomologist, met with Jack Kendley, forest silviculturist, and Donna Hawkins, forest technician, to evaluate Douglas-fir beetle populations in the Maudlow-Toston and Cave Gulch fires. In addition, they evaluated the effectiveness of the treatments aimed at reducing beetle-caused mortality within the fire perimeters in 2002.

Beetle populations within the fire perimeter in Maudlow-Toston and in green stands near the perimeter of Cave Gulch are still increasing and are at low to moderate levels. The salvage initiated in Maudlow-Toston probably had a significant effect on beetle populations in 2002. However, there are still many areas with partially burned trees that are very attractive to Douglas-fir beetle. Beetle populations may begin to move outside the fire perimeter in Maudlow-Toston in 2003. This migration from burned to unburned areas has already occurred on the Cave Gulch fire.

For 2003, combinations of treatments to reduce the undesirable amounts of beetle-caused mortality in and near the fire perimeters are discussed in the enclosed report. The report details observations, monitoring results and recommendations.

If we can be of further assistance, please contact us.

/s/ Gregg DeNitto (for)
WILLIAM W. BOETTCHER
Director of State and Private Forestry

cc: Jack Kendley, Gregg DeNitto, Ronald B Gibson



TRIP REPORT (TR 02-37)
Evaluation of Douglas-fir Beetle Populations and Treatment Effectiveness in the
Maudlow-Toston and Cave Gulch Fires
October 21, 2002

During the week of October 21, 2002, I met with Donna Hawkins and Jack Kendley to evaluate the status of the current Douglas-fir beetle population in the Maudlow-Toston and Cave Gulch fires. During the site evaluation, we discussed treatment options for bark beetles based on beetle population levels, status of the salvage operations, and the location and numbers of trees that still were susceptible to bark beetles.

Populations of Douglas-fir beetles (DFB) were at very low levels near both fires prior to 2000 based on aerial detection surveys. The Maudlow-Toston fire contained areas that burned with varying fire intensities. Many trees within the fire perimeter were partially burned and therefore very susceptible to Douglas-fir beetles, especially during the first few years following the fire. The 2001 bark-beetle survey showed that beetle populations were scattered and at low to moderate levels within the fire perimeter.

The Cave Gulch fire burned with high fire intensity over much of the drainage. Bark beetle buildup within the Cave Gulch perimeter was highest during the first year following the fire. The 2001 beetle surveys conducted by Forest Health Protection revealed that beetles were localized and at low to moderate levels and were attacking trees with high levels of fire-injury to the bole and/or crown (Trip Report TR 02-4). During 2002, most of the trees in Cave Gulch had no live cambium and therefore were no longer attractive to DFB, except in a few areas where the fire burned in a mosaic.

Douglas-fir Beetle Biology and Management

Douglas-fir beetles attack primarily Douglas-fir in our region. Beetles are attracted to slash, stumps, wind throw, and trees weakened by fire, drought, defoliation and disease. Populations build-up in such materials and can quickly expand and move into surrounding undamaged green stands. They overwinter beneath the bark of trees primarily as adults and usually emerge in mid-April to early June, depending upon weather. Typically, trees begin to fade the year after the attack but this can vary depending on the vigor of individual trees. Outbreaks of Douglas-fir beetle usually last between 3-5 years, but can cause between 60-80% mortality of Douglas-fir over 8 inches d.b.h. in high-hazard stands.

Extensive areas of damaged trees can concentrate beetles from a considerable distance. In general, beetle survival is greater in stressed trees and outbreaks can develop very quickly under these circumstances. A combination of management and weather will have a significant influence on beetle populations in the Maudlow-Toston and Cave Gulch fires over the next few years.

Several management options exist for treating DFB populations in addition to salvage. The choice of management options should be strongly linked to beetle population levels and the ability to successfully implement the treatment.

1. Use of "trap trees"--either downed green trees dropped in early spring, or green trees baited with pheromone tree baits. Either would require the removal of trap trees, and perhaps a few "spill-over" trees infested by beetles. Down, green trap trees may be slightly more attractive to beetles, but tree baits have the advantage of requiring only one entry to cut and remove trees. Approximately two standing baited trees, or downed trap trees per acre, dependent upon the size of the infested group, should be sufficient to attract most emerging beetles. **If the commitment to remove or treat trap trees cannot be made, this treatment should not be selected.** To install them, then not remove or treat them, would only increase the amount of mortality caused by DFB. Tree baits are about \$7 each. Either application, cutting trap trees or installing tree baits, should be done by about mid-April.
2. Use of pheromone-baited funnel traps. Funnel traps have been used to successfully "trap out" small, isolated populations of beetles in the past; and were used on Tally Lake District in both 1997 and 1998 and the BLM Boulder Complex fire in 2002. Not as useful for large or widespread populations, funnel traps can be effective in some situations now existing. They may not be as effective as trap trees or salvage, and there is the possibility of some nearby trees being attacked, but the use of traps would be the least expensive and result in the least amount of site disturbance. Traps and attractant pheromone lures are commercially available at a cost of about \$40 per set. Traps, placed in clusters of three near infested groups of trees, would be sufficient to trap most emerging beetles. They need to be installed by about mid-April; and emptied weekly for 6-8 weeks, or until catches cease.
3. For reducing beetle attacks in smaller, isolated areas, or when treating isolated beetle populations, use of the Douglas-fir beetle anti-aggregant methylcyclohexanone (MCH) is an alternative. Only recently registered for use as a means of reducing beetle attack in susceptible stands, MCH bubble capsules are commercially available, sell for about \$1.00- \$1.80 each, and are used at a rate of 30 per acre. Experimental use within the past several years has shown MCH effectively reduces beetle-caused mortality in Douglas-fir stands threatened by beetles. We can provide additional information on purchasing and applying MCH if desired.

Douglas-fir Beetle Management-2002

Jack's primary concern was to protect remaining partially burned trees that are not infested and surrounding uninfested green stands of Douglas-fir. The Helena NF has taken steps to reduce DFB population in the Maudlow-Toston fire area by salvaging during 2002. For salvage to be most effective, the beetle-infested and other susceptible trees should be removed prior to beetle flight by early spring the year following a fire. In an attempt to save as many trees that might survive the direct effects of fire, the Forest elected to only remove trees that had less than 30% live, green canopies. Some of these marked trees were infested with beetles during 2002 and were removed as part of the salvage operation in Maudlow-Toston. However, there were also many trees that did not meet the salvage criteria, therefore were not removed, but were infested by beetles. Recognizing the potential for continued DFB population increases, the Forest implemented additional bark beetle treatments in 2002.

For treating emerging beetles in 2002, the Forest applied MCH and placed pheromone-baited funnel traps in a few areas. MCH, the pheromone anti-aggregant, was used over larger areas mostly near the fire perimeter. MCH was also used in isolated stands of high-value such as old growth. Funnel traps were used in areas with low beetle population levels and in areas that had few remaining green trees.

During the summer of 2002, the Forest monitored funnel traps and recorded the approximate numbers of beetles caught. Thousands of beetles were caught in each of the funnel traps throughout the summer, with populations peaking in June and July. During October of 2002, Jack, Donna and Forest Health Protection personnel evaluated the effectiveness of funnel-trap treatments in the Maudlow-Toston fire. DFB infestations were measured by installing FINDITs plots to determine the number of trees attacked per acre. Plots were established adjacent to and near the areas where funnel traps were placed. All transects were at least 150 feet away from the funnel traps. Few beetle-infested trees were found on plots in transects near funnel trap areas. When beetles were found on plots, they were usually in trees closest to funnel traps. Average number of trees infested per acre near the funnel traps ranged between 4.52 to 15.35 in 2002; compared to 1.02 to 2.10 in 2001. Forest Health Protection also conducted a bark beetle survey of a selected number of partially green stands within the fire perimeter that had a high hazard rating to DFB. This survey showed that an average of 46.80 trees per acres were infested with DFB within the fire perimeter. The number of trees infested per acre was much lower near the funnel traps than other areas within the fire perimeter; however, they were still quite high. Beetle population levels within the fire perimeter were higher than anticipated and probably required additional funnel trap clusters within each treated drainage.

Douglas-fir Beetle Management-2003

During the week of October 21, I met with Jack and Donna again to discuss treatment options for DFB for 2003. After visiting many of the remaining green stands in both Maudlow-Toston and Cave Gulch, we developed a treatment plan for 2003, which includes trap trees, funnel traps and MCH. The salvage logging in Maudlow-Toston should be completed prior to beetle flight in 2003. The potential salvage in Cave Gulch will have very little to no effect on the DFB population.

For 2003, we discussed implementing the following treatments: funnel traps, trap trees and MCH. Trap trees were selected for areas that had moderate populations and were on or near the fire perimeter. If trap trees are used, the Forest must be committed to either removing or treating trees after beetle flight. The best option is to remove infested trap trees from the area. If this is not possible, trees could be cut into 2-foot bolts and scattered to increase the amount of solar radiation necessary for the beetle brood to die underneath the bark. Jack mentioned that the Forest might be able to cut, split and stack trees along the roadside for firewood cutters. If trap trees are not removed or treated, they will serve as additional sinks for producing more beetles for the following years. Trap trees, either pheromone baited or down trees are very attractive to DFB and typically produce significantly more brood than standing trees.

Funnel traps were selected as a “mop up” tool in areas that had been salvaged but had some remaining trees containing beetles. Funnel traps were also selected for areas that had isolated and/or low to moderate populations, and were located near existing roads or trails. Funnel traps should be placed prior to April 15 in order to maximize trap catches and, therefore, effectiveness. Traps will need to be monitored and emptied weekly for a 6- to 8-week period after beetle flight has begun.

MCH was selected for areas that were green, had very few to no apparently infested trees, and were isolated. MCH should also be placed on trees prior to beetle flight.

Although the direct effects of fire or beetles have killed many trees, there are many, perhaps 30-50% of larger diameter Douglas-fir trees remaining in unsalvaged areas. These remaining green trees are very important for seed production, wildlife habitat, aesthetics and erosion control. Beetle populations are currently at moderate levels, and we believe that a combination of trap trees, funnel traps and MCH will have a significant impact on the population. If the Forest decides not to implement additional treatments outside of salvage, mortality from DFB within the Maudlow-Toston fire perimeter and surrounding the Cave Gulch fire perimeter will continue.

If Forest Health Protection can be of assistance in providing information on the implementation of the above treatments, please let us know. We will be happy to assist you in selecting specific areas to use funnel traps or select trees to either cut or bait. We also recommend monitoring beetle populations and effectiveness of treatments over the next few years.

/s/ Nancy Sturdevant
Nancy J. Sturdevant
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